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Department of
Agriculture

Soil
Conservation
Service

Cape May
Court House, NJ

1993 ANNUAL REPORT

Cape May Plant Materials Center



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INTRODUCTION

History & Origin

The activities of the Cape May Plant Materials Center (Cape May PMC) for the calendar year of 1993 are contained in this report. The PMC is solely operated by the United States Department of Agriculture's Soil Conservation Service (USDA-SCS) in the state of New Jersey. The 88 acre Cape May PMC was established in 1965 after extensive storm damage had eroded much of the Mid-Atlantic coastline. The service area of this PMC is served by the Plant Materials Specialists stationed in North Carolina, New Jersey, and New York.

The Cape May PMC has been given the task of developing and promoting new and improved plants, as well as improving cultural methods and management techniques for conserving our vital natural resources. The primary objectives of the Cape May PMC in producing improved plants for conservation use include:

- Improve water quality.
- Reduce excessive cropland erosion.
- Reduce coastal shoreline and tidal bank erosion.
- Conserve natural resources in urban and rural areas.
- Improve organic waste management techniques.
- Improve grassland management techniques and forage quality
- Improve habitat for fish and wildlife

Although, the Cape May PMC has traditionally concentrated on reducing coastal sand dune and tidal bank erosion, the use of plant materials to improve water quality and establish wetlands has become the priority for its service area. The Cape May PMC will meet these newly prioritized objectives as we progress through the 90's. The procedure by which the center develops and promotes plant materials to meet such objectives is as follows:

- Collect and evaluate plant materials including native collections, foreign plant introductions and strains from plant breeders.
- Increase seed and/or plants of potential new releases.
- Make advanced evaluations of selected accessions under simulated field conditions in comparison with a standard variety.

- Determine cultural requirements of needed plant materials.
- Make off-center plantings on problem sites to obtain information on plants for eventual use on these sites.
- Provide plant propagules for field plantings to Soil and Water Conservation Districts where the final evaluation of a new plant is to be made.
- Develop, name and release new varieties in cooperation with the New Jersey Agricultural Experiment Station or other cooperating agencies.
- Maintain and produce breeder or foundation seed or stock of released varieties at the center in accordance with the New Jersey plant and seed certification standards.

Location & Site Description

The Cape May PMC is located in Cape May County which is New Jersey's southern most county. The center is approximately 24 miles south of Atlantic City, New Jersey sandwiched between the Garden State Parkway and US Route 9. Approximately, 500 feet east of the PMC starts the tidal marsh which surrounds Great Sound, a body of water lying between the Cape May PMC and the Borough of Avalon.

The climate at the Cape May PMC varies from semi-humid to semi-maritime conditions with average precipitation at 41 inches. During periods when precipitation is below normal, a deep (5.5) acre pond, on the PMC, is utilized for irrigation. The average annual maximum and minimum temperatures at the Cape May PMC are 63°F and 44°F, respectively. The Cape May PMC lies in USDA Plant Hardiness Zone 7b, with approximately a 192 day growing season.

The soils on the Cape May PMC are the product of wind mixed marine soils and glacial outwash which has weathered since the Pleistocene Age. The Downer, Sassafras, Fort Mott, and Woodstown soil series are all found on this property with the Downer and Sassafras predominating the acreage. The soils on the Cape May PMC can be generally described as nearly level, well drained, with low to moderate naturally fertile soils. These soils encountered at the Cape May PMC are usually strongly acid in their natural state. The surface feature of these soils ranges from sand to loamy sand. Most fruits and vegetables can be grown on these soils but irrigation is a necessity to insure success. The elevation of the Cape May PMC ranges from 18 to 21 feet above sea level, with slope not exceeding one percent. The four soil series listed above have Soil Capability Classes ranging from I for the Sassafras series to III for the Fort Mott series. When trees are considered for production, the site indices for native oak, hickories, gums, and pines range from 66 to 85.

Agricultural operations are predominantly cash row crops, orchards, truck crops, specialty crops, and poultry. Livestock enterprises have disappeared from many farms which have switched to continuous cultivated crops. This trend to cash crop operations has reduced the use of hay and pasture plants in the cropping systems. Clean cultivation on large tracts of land has increased soil erosion. The problem is especially prevalent on large open acres of flat sandy soils and all sloping land during periods of inadequate soil cover.

Non-agricultural activities play a dramatic role in the use of conservation plants. There is a large portion of this area covered by hardwood and pine forests, much of which is not managed. Extensive areas of tidal marsh are vital to the seafood and wildlife resources which are essential to this area's economy. Also, sand and gravel mining, expanding land facilities, and construction of industrial as well as residential developments, are all areas where plants can be used to stabilize disturbed sites.

Fifteen percent of the nation's population lives within commuting distance of the area served by the center. In most areas, an extensive summer resort industry has expanded into a year-round enterprise, creating a demand for high use recreational facilities.

A map illustrating the distribution of the Cape May PMC's off-center project sites follows which indicates the PMC's current workload (See Off-Center Project Location Map). The area served by the Cape May PMC includes the Mid-Atlantic coastal plain and the piedmont area, extending from Cape Cod, Massachusetts to Sunset Beach, North Carolina (See Service Area Map). The Major Land Resource Areas within the service area are listed below under the nine states each is associated with.

Massachusetts

- 143 - Northeastern Mountains
- 144A - New England and Eastern New York Upland, Southern Part
- 144B - New England and Eastern New York Upland, Northern Part
- 145 - Connecticut Valley
- 149B - Long Island, Cape Cod Coastal Lowland

Connecticut

- 144A - New England and Eastern New York Upland, Southern Part
- 145 - Connecticut Valley

Rhode Island

- 144A - New England and Eastern New York Upland, Southern Part

New York

- 149B - Long Island - Cape Cod Coastal Lowland

New Jersey

- 144A - New England and Eastern New York Upland, Southern Part
- 148 - Northern Piedmont
- 149A - Northern Coastal Plain

Maryland

- 148 - Northern Piedmont
- 149A - Northern Coastal Plain
- 153B - Tidewater Area
- 153C - Mid-Atlantic Coastal Plain

Delaware

- 148 - Northern Piedmont
- 149A - Northern Coastal Plain
- 153C - Mid-Atlantic Coastal Plain

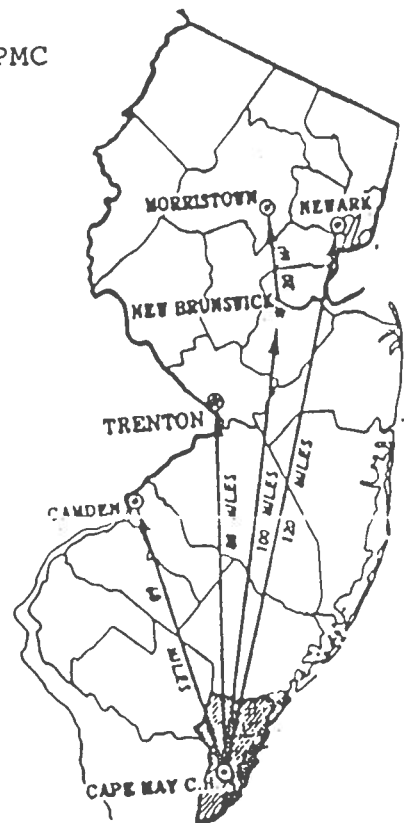
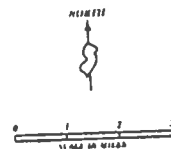
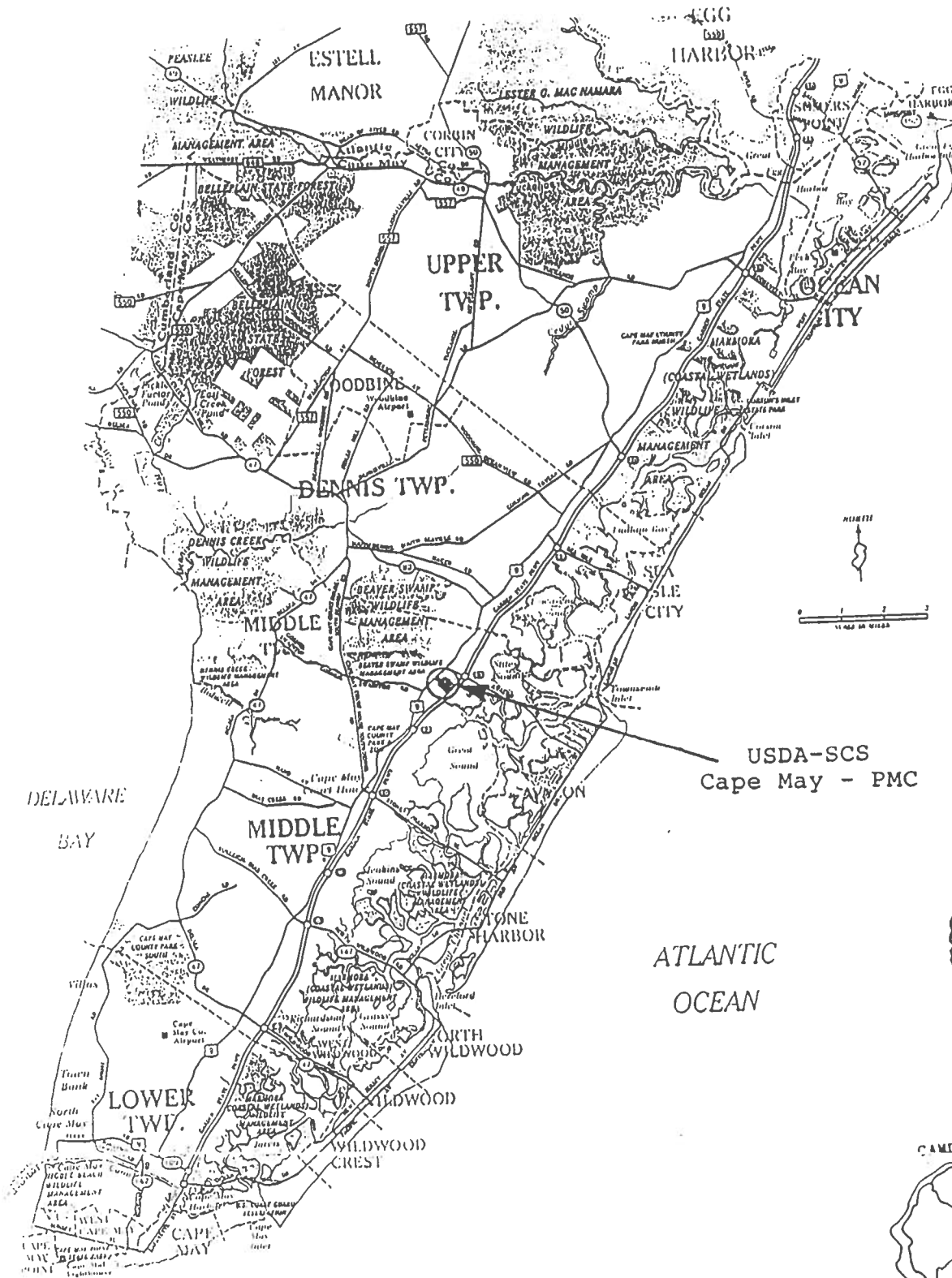
Virginia

- 133A - Southern Coastal Plain
- 136 - Southern Piedmont
- 153A - Atlantic Coast Flatwoods
- 153B - Tidewater Area
- 153C - Mid-Atlantic Coastal Plain

North Carolina

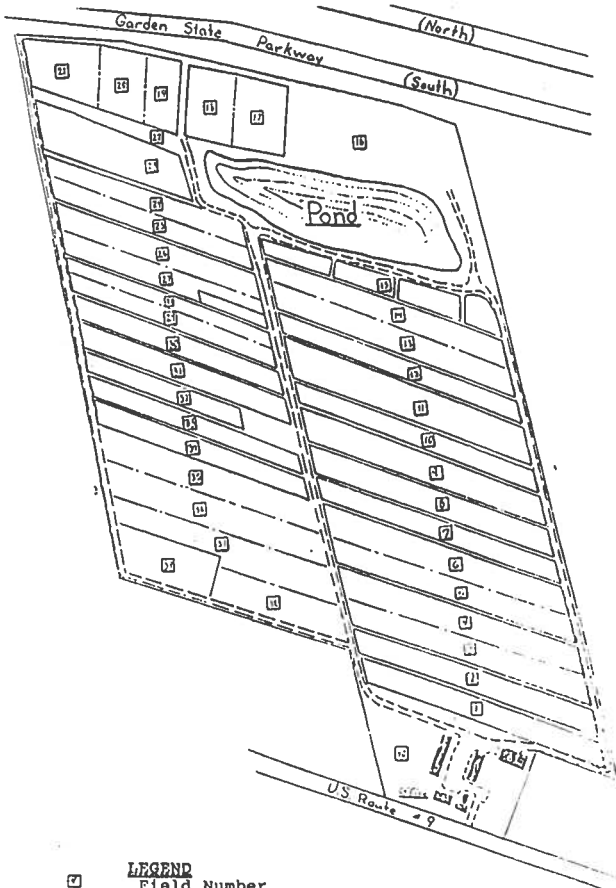
- 133A - Southern Coastal Plain
- 136 - Southern Piedmont
- 153A - Atlantic Coast Flatwoods
- 153B - Tidewater Area

CAPE MAY - PMC LOCATION MAP
USDA - Soil Conservation Service
Cape May Court House, NJ



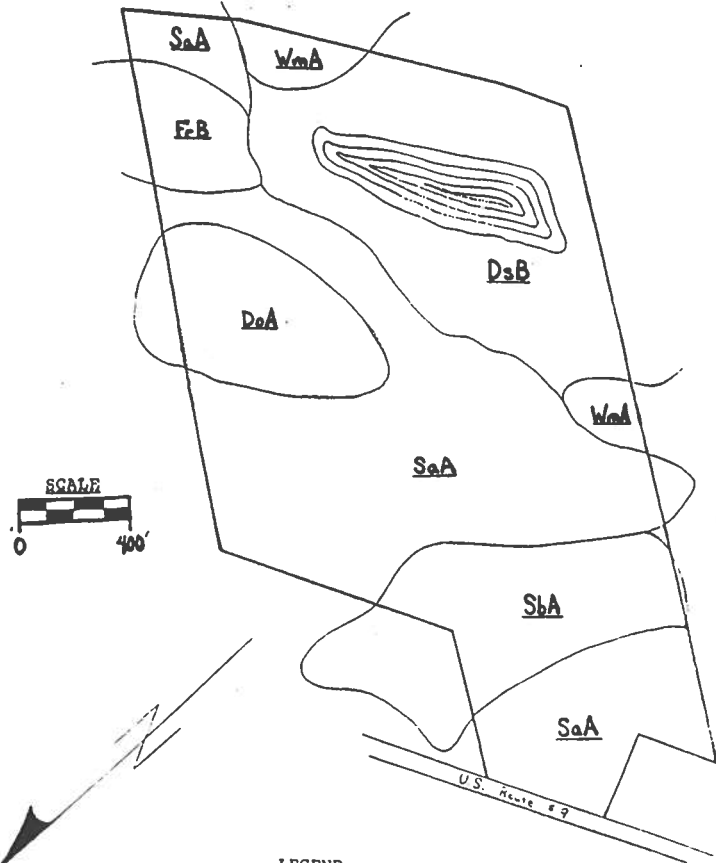
**USDA SOIL CONSERVATION SERVICE
CAPE MAY PLANT MATERIALS CENTER
(± 88 ACRES)**

PROPERTY & FIELD MAP



LEGEND
 Field Number
 Access Lane
 PMC Buildings
 Field Divisions
 Pond

SOILS DELINEATIONS



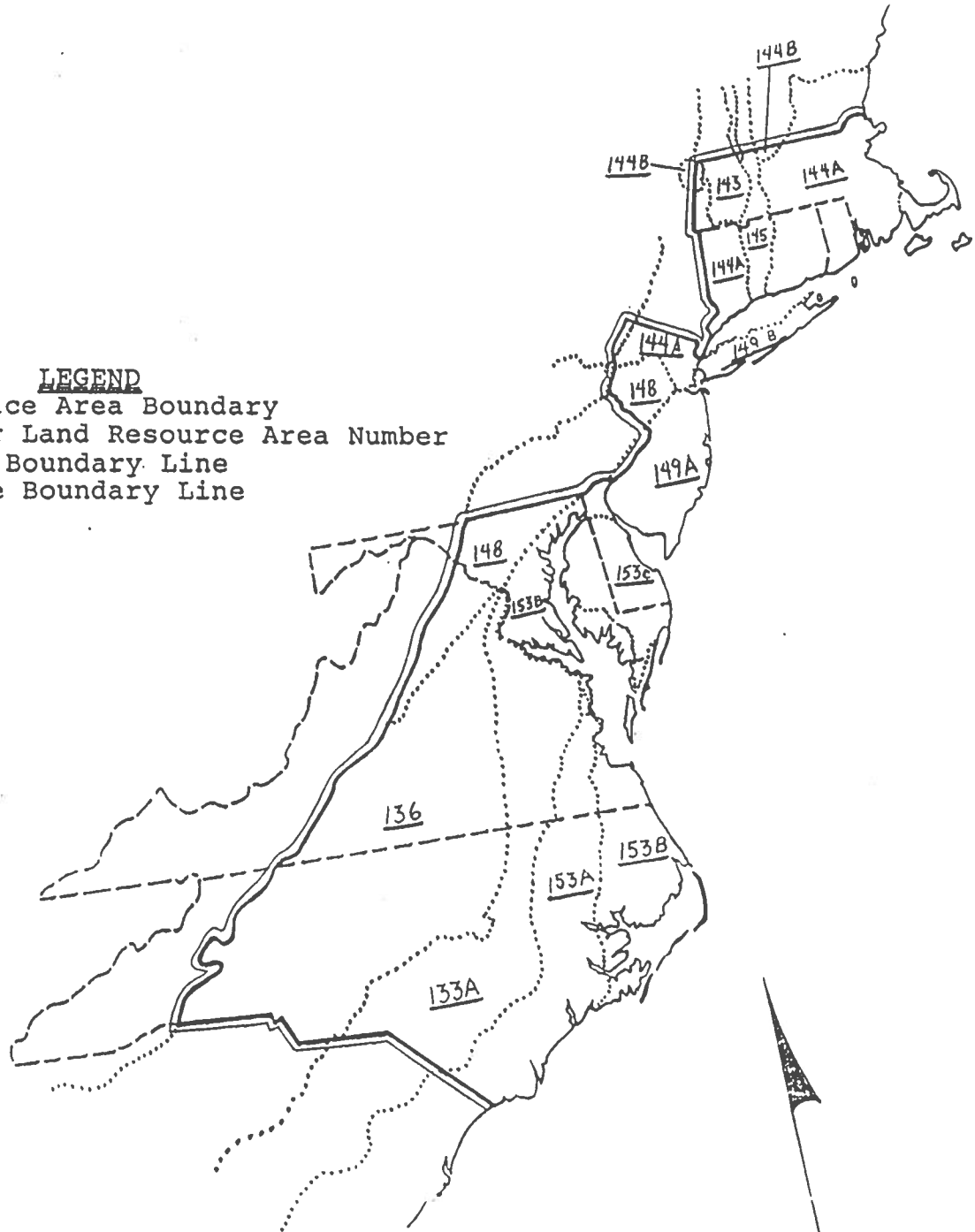
LEGEND
 DoA Downer loamy sand, 0-3% slopes
 DsB Downer sandy loam, gravelly substratum, 0-5% slopes
 FrB Fort Mott sand, 0-5% slopes
 SaA Sassafras sandy loam, 0-2% slopes
 SsA Sassafras sandy loam, water table, 0-2% slopes
 WmA Woodstown sandy loam, 0-2% slopes

SERVICE AREA MAP

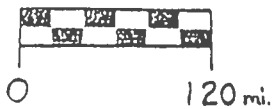
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LEGEND

===== Service Area Boundary
+----- Major Land Resource Area Number
..... MLRA Boundary Line
----- State Boundary Line



SCALE



SERVICE AREA

Description of Service Area

The soils, topography, climate, and land use combine to produce distinct plant resource areas. The soil-forming materials of the Mid-Atlantic Coastal Plain include glacial outwash and underlying beds of sand, gravel, silt, and clay. Problems in this area include active migrating sand dunes that exist along the coast, wind erosion which occurs on sandy cultivated fields, and water erosion on sloping cropland, and stream bank erosion which threatens the tidal estuaries. The soils vary from excessively well drained to poorly drained and swampy. There are large tracts of tidal marsh bordering bays, river inlets and the ocean.

The topographic relief ranges from large areas of level or slightly sloping land to less extensive sections of moderately rolling ridges. The relatively level coastal plain rises from sea level to elevations of more than 600 feet in the piedmont. Level to gently undulating topography characterizes the coastal plain, while gentle slopes and steep ridges are predominant in the piedmont.

The climate is tempered by the Atlantic Ocean. There are wide fluctuations in annual precipitation, and to a lesser extent, in temperature. Drought years do occur and tropical hurricane storms are common. Mean annual precipitation in the area ranges from 38 to 46 inches. The frost-free season varies from 170 to 250 days, with the mean being 192 days. Length of growing season is affected by latitude and elevation. The Cape May PMC Service Area includes USDA Plant Hardiness Zones 5-8.

WEATHER RECORDS AT CAPE MAY PLANT MATERIALS CENTER FOR 1993

Month	Air Temperature Of				4" Soil Temperature Of				Precipitation							
	Maximum		Minimum		Maximum		Minimum		Total Inches	Devi- ation	Greatest. Daily	No. Days				
	Ext.	Av.	Deviation	Ext.	Ext.	Av.	Deviation	Ext.								
Jan.	63	47	+6	+5	29	18	50	41	+2	0	37	33	3.52	+0.10	1.08	9
Feb.	55	43	0	-3	22	7	40	36	-3	-3	33	31	2.14	-0.85	1.08	6
March	59	46	-4	-3	30	15	49	40	-6	-6	36	31	6.65	+3.02	2.81	17
April	71	61	+1	+1	40	30	59	53	-2	-5	45	34	2.29	-1.24	.55	8
May	85	72	+3	+2	52	36	72	65	-1	-2	58	49	2.59	-1.04	.70	10
June	93	79	0	0	60	46	81	74	-2	-4	66	60	2.00	-1.11	1.43	6
July	100	87	+3	+2	68	58	91	83	+2	0	76	72	3.08	+0.32	2.01	4
Aug.	92	83	0	+1	65	57	85	80	0	-2	73	69	1.53	-2.51	.73	8
Sept.	94	79	+2	+2	60	43	88	75	+1	-2	68	59	1.25	-1.46	.51	8
Oct.	75	66	0	-1	44	35	68	61	-3	-6	54	45	4.29	+1.02	.97	9
Nov.	77	58	+4	-5	34	24	60	51	-1	-4	45	38	2.33	-1.07	.75	7
Dec.	58	43	-3	-3	26	16	52	42	-2	-4	37	31	4.57	+0.90	2.20	7
1993	100	64			44	7	91	58			52	31	36.24	-3.92	2.81	99
Normal*	63				44			60			56		40			

*Normal based on:

28 yr. Air Temperature Average; 24 yr. Soil Temperature Average; 28 yr. Precipitation

Frost Free Days 208 - April 8 to November 3, 1993. Normal 192 days.

Snow - .75" on February 26 and 1" on March 15; total 1.75" for 1993.

WATER QUALITY PROJECTS

1. PLANT CHEMICAL RECLAMATION PROJECT
2. INITIAL EVALUATION OF SWEET VERNALGRASS
(ANTHOXANTHUM ODORATUM)
3. PROPAGATION TECHNIQUE FOR PERENNIAL WETLAND
PLANT SPECIES OF THE MID-ATLANTIC UNITED STATES

1993 Progress Report of the Plant Chemical Reclamation Project
for Cape May Plant Materials Center

Vegetative filter strips have been used in the past to uptake excess nutrients, such as nitrates, before they reach the ground or surface waters. The objective of this project is to develop a plant materials list identifying the best possible plants for vegetative filter strip use under varying site conditions and management practices.

The following is a summary of the activities that took place during the calendar year of 1993 for the Plant Chemical Reclamation Project.

Plant Species and Cultivars

<u>Species</u>	<u>Cultivar</u>
Sweet vernalgrass (<u>Anthoxanthum odoratum</u>)	common
Matua prairiegrass (<u>Bromus willdenowii</u>)	common
Orchardgrass (<u>Dactylis glomerata</u>)	'Comet'
Tall fescue (<u>Festuca arundinacea</u>)	'Tribute'
Perennial ryegrass (<u>Lolium perenne</u>)	'Repell'
Switchgrass (<u>Panicum virgatum</u>)	'Cave-in-Rock' 'Shelter'
Reed canarygrass (<u>Phalaris arundinacea</u>)	'Palaton'
Kentucky bluegrass (<u>Poa pratensis</u>)	'Park'

Water Collections

Nine water collections occurred during 1993. There were two collections in March, two in May, one in August, two each in October and November. The precipitation during the rainfall events ranged from 0.73-3.34 inches. The water samples were shipped to the University of Rhode Island during the fiscal year of 1993 and part of fiscal year 1994 for analysis of nitrate-nitrogen concentration.

Cutting Treatments and Tissue Collections

Three HARVEST treatment cutting dates of 1993 were: June 1 and 2; July 26 and 27; and October 9. Following the cuts, the clippings were removed from these plots.

All the cool-season grasses received a cut on June 1 and 2 while the warm-season grasses did not. For the July 26 and 27 cut, the two warm-season grasses were cut along with all the cool-season grasses except 'Repell' perennial rye. On the third cutting date of the year, the two warm-season grasses were cut along with the cool-season grasses Matua prairiegrass and Palaton reed canarygrass.

In addition, on the second cutting date of the year, the plots of CLIPPED treatment were cut and the clippings were left on the plots.

On each of the three cutting dates of the year, all plots of the HARVEST treatments were sampled by clipping a one meter square area, collecting the clippings, obtaining a wet and dry weight and grinding the dried sample. The CLIPPED treatment plots were sampled on the first two cutting dates, only. The plant samples were shipped to the University of Rhode Island for analysis of total kjeldahl nitrogen.

Soil Collection

For soil fertility analysis soil samples were collected on April 8 and November 19 from all the plots and dried and sieved. The soil samples were shipped to the University of Rhode Island for analysis of nitrate-nitrogen.

Fertilization and Pest Control

The project received a total of 11 lbs. nitrogen per 1000 sq. ft. in the form of urea during 1993. The first fertilizer application was April 4 at a rate of 2 lbs. nitrogen per 1000 sq. ft. The second through fourth applications were at a rate of 3 lbs. nitrogen per 1000 sq. ft. on June 25, August 9 and October 5, respectively.

A preemergence herbicide, Balan 25G, was applied on the cool-season grasses and control plots at a rate of 1 lb. active ingredient per acre on April 19. To control broadleaf weeds in all the grasses and control plots, 2,4-D Amine and Banvel were applied at a rate of 1/2 pt./A of each on May 6.

Monthly Precipitation (inches)

Jan. 3.52	May 2.59	Sept. 1.25
Feb. 2.14	June 2.00	Oct. 4.29
March 6.65	July 3.08	Nov. 2.33
April 2.29	Aug. 1.53	Dec. 4.57

Laboratory Analyses Results

Results are not available at the time of this report.

**INITIAL EVALUATION OF SWEET VERNALGRASS
(ANTHOXANTHUM ODORATUM)**

Nitrate leaching into ground and surface water is a major concern of recent times. This contamination can result from cropland practices, home lawn maintenance and animal waste disposal among other things. One approach of reducing nitrate contamination of ground and surface water is the use of plant species that have abilities to uptake large amounts of nitrates. University research has shown that sweet vernalgrass (Anthoxanthum odoratum) is one such species. The objective of this initial evaluation of sweet vernalgrass is to identify and develop a superior cultivar for release, which can be utilized for vegetative filter strips.

An assembly of fifty-six accessions of sweet vernalgrass was planted into Field 2 of the Cape May PMC in September 1990. In 1992, 15 top accessions were chosen and seed was collected. The remaining accessions were rouged out.

The accessions were evaluated for survival, vigor, foliage abundance, cover, and relative rank. This grass will continue to be evaluated until a superior cultivar is chosen.

THE DEVELOPMENT OF EFFECTIVE PROPAGATION AND ESTABLISHMENT TECHNIQUES FOR NATIVE EMERGENT PERENNIAL WETLAND PLANT SPECIES

In a region where water quality has become the primary concern of the SCS, freshwater wetlands have received much consideration in their function in reducing stream born and groundwater pollution. It has been expressed to the Cape May PMC Staff that although benefit can be attained with the use of wetlands to improve water quality, success in establishing emergent vegetation on such sites has been inconsistent. In some instances, vegetation was successfully established but failed to persist through the second or third years. Plant Materials Centers' evaluations potentially, could identify the limiting factors to successful plant establishment. The representatives of the states served by the Cape May PMC have expressed high priority needs for such wetland plant establishment data for the Mid-Atlantic region.

The initial study plans were developed by the Cape May PMC team in 1991. Attempting to establish the first phase of the evaluations early in 1992. It was agreed upon at that time that commercially available plants would be utilized for the study. Unfortunately, the first lessons in wetland planting were learned. The primary lesson being that one cannot expect to secure enough plants for spring planting in January or February of the same year. It was surveyed that in order to acquire emergent wetland plants from a commercial source, the nursery has to be contacted by the preceding October. Needless to say, the target number of plants for the species desired for assembly at the Cape May PMC were arranged for in time to establish two studies on center in June of 1993.

The first replicated study observes the plant development and uniformity of the species acquired from common sources. The planting site was maintained in a saturated condition flooded with three inches of water throughout the growing season. Eleven species of native emergent fresh water wetland plants were observed. They are:

<i>Alisma subcordata</i>	common water plantain
<i>Juncus effusus</i>	soft rush
<i>Peltandra virginiana</i>	arrow arum
<i>Pontederia cordata</i>	pickerelweed
<i>Sagittaria latifolia</i>	duck potato
<i>Scirpus acutus</i>	hardstem bulrush
<i>Scirpus cyperinus</i>	wool grass
<i>Scirpus tabernaemontani</i>	softstem bulrush
<i>Sparganium eurycarpum</i>	giant burreed
<i>Typha angustifolia</i>	narrow-leaf cattail
<i>Typha latifolia</i>	broad-leaf cattail

All species, but the Alisma subcordata, established well; those established had nearly 100% survival throughout the planting as of September. Time release fertilizer was applied to one-half of all the plants of each species in each replication. The following comments are summaries of general observations witnessed at Cape May during this first year of the wetland plant characteristic study:

- Species slow to develop and spread included Alisma subcordata, Peltandra virginica. and Typha angustifolia.
- Most uniform growth observed within the species included Juncus effusus, Pontederia cordata, Scirpus cyperinus, and Sparganium eurycarpum.
- The greatest amount of biomass was produced by Juncus effusus, Sagittaria latifolia, and Scirpus tabernaemontani.
- In the fall and early winter, the species which had the best biomass persistence included Juncus effusus, Scirpus cyperinus, S. tabernaemontani, and Typha latifolia. All of the broadleaf species disintegrated soon after senescence.
- Only Juncus effusus and Scirpus cyperinus showed no noticeable physical response to fertilizer application.

This study will be observed for the next two years to track its development and will be repeated at least once more at the Cape May PMC.

The second study of this project was designed to observe and record interspecies competition. The circular plot configuration was new and innovative for Cape May; the idea came from a variable spaced grass trial at the Bridger, Montana PMC. Five plants were evenly arranged along twenty-four twelve foot rays joined at a center point, creating a wagon wheel effect. The evenly spaced plants formed rings of plants at 6 inches, 1 ft., 2 ft. and 3 ft. spacings. Two of these plots were established in 1993 at the Cape May PMC. The same species used in the preceding study are again used in this one. Some of the preliminary results as of October 1993 included:

- The species of Scirpus, Typha, Sparganium, and Sagittaria dominated these circular plots.
- The predominant plant spread was radial rather than tangential.
- Stand closure was experienced at 6" and 1' spacings by October of 1993.

- Regardless of plant spacing nearly 100 percent survival was experienced throughout the planting.
- Plant character did not deviate much from that observed in the first study.

The study was maintained under the same maintenance schedule and practices used in Study No. 1. The two plots described in this study will be maintained and monitored for, at least, three more years without disturbance. The progressive results witnessed over the next few years should give some insight on the establishment of diverse plant communities of emergent wetland vegetation for construction of impoundments.

1993
SAND DUNE RESTORATION PROJECTS

1. INITIAL EVALUATION OF SEA OATS (UNIOLA PANICULATA)
2. EVALUATION OF AMERICAN BEACHGRASS (AMMOPHILA BREVILIGULATA) FOR LONGEVITY
3. ADVANCED EVALUATION OF SEASIDE GOLDENROD (SOLIDAGO SEMPERVIRENS) FOR SAND DUNE RESTORATION
4. EVALUATION OF SALTMEADOW CORDGRASS (SPARTINA PATENS) ON SAND DUNES

INITIAL EVALUATION OF SEA OATS
(UNIOLA PANICULATA)

Sea oats (Uniola paniculata) is a warm season (C₄), perennial bunchgrass that is the dominant native foredune species of the coastal strand environment extending from Northampton County, Virginia south to Florida and the Dry Tortugas in the Caribbean and west to Texas and the Gulf states of Mexico. In addition to being dominant on the frontal dune, sea oats occur through the backdune and rear depressed areas of the coastal ecosystem, where they are commonly found with bitter panicgrass (Panicum amarum) and saltmeadow cordgrass (Spartina patens).

Many authors have noted that diverse planting mixtures are preferable over monocultures for promoting stand longevity, pest resistance, and the ability to withstand environmental degradation. Sea oats is considered to be excellent for companion planting with American beachgrass (Ammophila breviligulata) and bitter panicgrass. As a consequence of sea oats being a warm-season grass and American beachgrass being cool-season, mixed plantings offer a maximum amount of yearly growth and, hence, sand-binding ability. Although the increased rate of tillering for American beachgrass allows for faster establishment, sea oats tends to outlive and take over beachgrass plantings over time. Sea oats tends to remain more vigorous than does American beachgrass under conditions of reduced fresh sand accumulation. In addition, sea oats has been noted as much more resistant to marasmius blight than is American beachgrass, bitter panicgrass, or coastal panicgrass.

The Cape May PMC began the evaluation of sea oats in 1982 with the dual objective of selecting an ecotype with cold tolerance and selecting/breeding an ecotype with superior vigor. Currently, there are 32 accessions located in various evaluation sites in Virginia, Delaware, New Jersey, and New York. In June of 1990, the 25 accessions were planted in a replicated evaluation for northern range at Barnegat Light, New Jersey.

Sixteen ecotypes were chosen in 1990 for continued evaluation for superior vigor. Interestingly, all but six of the sixteen accessions were previously chosen for inclusion in the evaluation for northern range. The sixteen ecotypes with potentially superior vigor were planted in June of 1991 in a replicated planting located at Delaware Seashore State Park.

In both the 1991 and 1992 superior vigor plantings established in Delaware, survival has been good even after severe winter storms. In 1993, seedheads were produced in the 1991 planting for the first time. Sand accumulation, vigor, and foliage abundance were exceptional in two replications of the 1992 planting demonstrating the plant performance relationship with adequate sand deposition. Regardless of sand accumulation, sea oats can not tolerate heavy pedestrian traffic; such damage has occurred

with two accessions in the 1992 planting. Untrampled accessions are growing well even with site competition from clumps of coastal panicgrass; these same vigorous plants continue to spread readily by tillers.

From the performance in these studies, the ten best accessions of sea oats in the superior vigor project were selected:

<u>Original Accessions No. / 1/2-Sib Progeny Accession No.</u>	
9030194	9061171
9061157	9061172
9061158	9061173
9061165	9061202
9061168	9061203

These accessions were placed in a crossing block in 1994 in the attempt to produce a cross pollenated progeny.

The Avalon, New Jersey cold tolerance plantings of 1991 and 1992 were both lost due to tidal flooding. The spring growth of the Barnegat Light, New Jersey cold tolerance planting of 1990 has now become impossible to identify and a new planting will be established in 1994.

The harsher winter of 1992-93 delayed the spring growth of the sea oats cold tolerance plantings in New Jersey. The winter of 1993-94 was even harsher and it will be interesting to see the effect it has on the sea oat plantings. The Long Island, New York planting of 1993 will be a good test of the northern adaptation of this species.

Additional studies in 1994 will:

- 1) Compare 26 cold-tolerant ecotypes in a replicated study in New Jersey,
- 2) Compare the top ten superior vigor ecotypes in replicated studies in North Carolina and Maryland
- 3) Observe the potential of sea oats to be vegetatively divided and propagated.

Sea Oat Accessions Included in the Cape May PMC Initial
Evaluation for Northern Range and Superior Vigor

<u>Original Acc. No.</u>	<u>1/2-sib Progeny No.</u>	<u>Original Collection Site</u>	<u>Included in Cold Tolerance Evaluation</u>	<u>Included in Superior Vigor Crossing Block</u>
<u>1/</u>	<u>2/</u>		<u>3/</u>	<u>4/</u>
9027034	9061156	Back Bay, VA	yes	no
9027035	9061157	VA Beach, VA	yes	yes
9027036	9061158	VA Beach, VA	no	yes
9030194	9061159	Cape Charles, VA	yes	yes
9030199	9061163	VA Beach, VA	yes	no
9030201	9061165	VA Beach, VA	no	yes
9030203	9061167	VA Beach, VA	yes	no
9039013	9061168	Northampton, VA	yes	yes
9039031	9061169	Carteret, NC	yes	no
9039033	9061202	Georgetown, SC	yes	yes
9039034	9061170	Georgetown, SC	yes	no
9039036	9061171	Georgetown, SC	no	yes
9039037	9061173	Georgetown, SC	no	yes
9041959	9061173	Charlestown, SC	yes	yes
9041961	9061174	Dare, NC	yes	no
9041969	9061203	Currituck, NC	yes	yes
9041970	9061175	Dare, NC	yes	no
9041971	9061176	Dare, NC	yes	no
9041972	9061177	Dare, NC	yes	no
9041973	9061178	Dare, NC	yes	no
9041974	9061179	Dare, NC	yes	no
9041975	9061180	Dare, NC	yes	no
9041976	9061181	VA Beach, VA	yes	no
9041977	9061182	VA Beach, VA	yes	no
9041979	9061184	VA Beach, VA	yes	no
9041981	9061186	VA Beach, VA	yes	no
9041983	9061188	VA Beach, VA	yes	no
9041984	9061189	VA Beach, VA	yes	no
9041985	9061190	VA Beach, VA	yes	no
9061242	-----	CM PMC Random-X Cape May, NJ	yes	no

1/Represents the accession number assigned to ecotype at the time of initial collection.

2/Represents the accession number assigned to 1/2-sib progeny from the original ecotype.

3/Evaluation for cold tolerance includes 26 accessions total.

4/Evaluation for superior vigor includes 10 accessions total.

**EVALUATION OF AMERICAN BEACHGRASS
(AMMOPHILA BREVILIGULATA) FOR LONGEVITY**

American beachgrass (Ammophila breviligulata) is the dominant foredune plant from Virginia north to Nova Scotia. In addition, American beachgrass is also the species used most for the initial stabilization of the frontal dune portion of the Mid-Atlantic coast. Released from the Cape May PMC in 1972, the cultivar 'Cape' is considered to be superior for restoration use north of the Chesapeake Bay. However, many American beachgrass stands have exhibited a decline in vigor and eventual die-out in some sites despite proper management. The decline and subsequent die-off have been attributed to both insect and disease, but the exact cause of the problem has yet to be determined. As such, the purpose of this project is to compare Cape against other accessions of American beachgrass to note their relative longevity and growth form. It is hoped, that from this comparison, an ecotype can be found or bred that exhibits greater longevity and retains the superior vigor and growth attributes associated with Cape.

Seven (7) accessions are currently involved in the evaluation, including the cultivars Cape, 'Hatteras', and 'Bogue' as well as accessions 9047071, 9047072, 9047073, and 9047085. Hatteras, Bogue, 9047071, and 9047072 originated from the Carolinas, while 9047073 and 9047085 were collected from sites in Virginia Beach, Virginia. Cape American beachgrass was collected in 1965 from Barnstable County, Massachusetts. The current off-center active planting is at Sandbridge, Virginia. Since its establishment in 1991, the planting of American beachgrass at Back Bay National Wildlife Refuge, Virginia has accumulated enough sand to increase the site's elevation by eight to ten feet. Even though the seven accessions originally planted on this site have grown together and can not be differentiated, there is no evidence of stand decline. Due to the volume of sand accumulation, all accessions seem to be growing vigorously, but no one excelling over the other.

In addition, on-center plantings include:

- 1.) A replicated comparison of the included accessions for longevity,
- 2.) A random crossing block for the development of an additional accession with the potential for increased longevity, and.
- 3.) A progeny test of the above crossing block.

ADVANCED EVALUATION OF SEASIDE GOLDENROD
(SOLIDAGO SEMPERVIRENS) FOR SAND DUNE RESTORATION

Seaside goldenrod (Solidago sempervirens), a native perennial forb of the Mid-Atlantic region, has been evaluated for eight years. The number of accessions during that time period has been reduced to seven from seventy-nine. This forb is adaptive to both the fore and back dune area of the natural dune ecology. Seaside goldenrod has been observed to grow well in areas where American beachgrass (Ammophila breviligulata) is displaying signs of decline. Realizing the fact that such decline in American beachgrass is common to the Mid-Atlantic region, seaside goldenrod is being considered for inter-planting with American beachgrass to provide continuous vegetative cover particularly in the back dune area. Although seaside goldenrod is unbranched, it still provides acceptable erosion protection to stabilize these beach sites. It is the Cape May PMC's objective to select and develop a superior variety of seaside goldenrod to compliment American beachgrass in stabilizing the sand dunes.

In the spring of 1989, the seven remaining accessions in the study were transplanted into Field 9 of the Cape May PMC with varying success. By the spring of 1993, only plants of six accessions still remained in Field 9. Vegetative divisions of these six remaining accessions were taken and established in a randomized Latin Square in Field 21 of the Cape May PMC as a seed production block. Seed was collected from each plant. In 1994, seedlings will be grown out of the individual parent accessions to test the performance of each and determine if they will be of use in vegetating sand dunes.

EVALUATION OF SALTMEADOW CORDGRASS
(SPARTINA PATENS) FOR DUNE RESTORATION

The detection of decline in the health of American beachgrass (Ammophila breviligulata) stands on coastal sand dunes has prompted the realization that pure stands of American beachgrass are not safe from an erosion protection stand-point. A complex of associated herbaceous dune species would be preferred. Such combinations would provide continuous stabilization in the event that pathogens were to reduce or eliminate the effectiveness of one species. The success of saltmeadow cordgrass (Spartina patens), as part of such a complex, is being evaluated at three locations in Delaware and New Jersey. It is hoped that this native of the backdune area can survive on the shifting sands of the foredune. This species of cordgrass is very salt and drought tolerant.

At Brigantine Beach, New Jersey, a planting of saltmeadow cordgrass accession 421250 was installed in mid-April 1990. It was located approximately 150 feet from the surf on a level area of the beach. On the nearby dunes, the predominant native species was American beachgrass. This planting consisted of two replications of 72 saltmeadow cordgrass plants which were surrounded by two border rows of American beachgrass. The last evaluation performed on this planting in 1990 yielded an average rate of 83 percent survival and a moderate rating for foliage production. In 1992, the stand had begun to fill in with good vigor and accumulated 2.3 feet of sand. The stand remained in 1993 even after being roughed up, covered, and drowned by winter storms.

With the preliminary success at Brigantine, New Jersey, two additional plantings of saltmeadow cordgrass on the foredunes were installed in 1992 on sites at Delaware State Seashore Park south of Dewey Beach, Delaware and in Avalon, New Jersey. Besides accession 421230, accessions 421237, 421238, and native material collected from adjacent sand dunes were planted for comparison in June 1992. This proved to be too late as the plants either died or had poor performance. Two new plantings were then installed during the spring of 1993 at the same locations.

The 1993 planting at Delaware Seashore State Park was very successful. Using the same accessions listed above, nearly 100 percent survival was witnessed. In two of the three replications, accession 421250 was noted to be growing the best on this frontal dune blowout site. Even though one accession seemed to dominate in the planting, all performed well on this harsh dune site. This planting will be monitored and evaluated throughout 1994 and 95 to determine the usefulness of this species on the frontal dune.

In May 1993, a planting was established in Avalon, New Jersey to replace the failed 1992 planting. The planting included accessions 421250, 421237, and 421238 along with native material. The planting did survive in 1993 but because of its location in a frontal dune area, it accumulated much sand and appears to be smothered. A 1994 planting will be made in a more favorable location.

1993 COVER CROP PROJECTS

1. INITIAL EVALUATION OF EASTERN GAMAGRASS
(TRIPSACUM DACTYLOIDES)
2. INITIAL EVALUATION OF SAINFOIN
(ONOBRYCHIS VICIAFOLII)
3. INITIAL EVALUATION OF SUBTERRANEAN CLOVER
(TRIFOLIUM SUBTERRANEUM)

INITIAL EVALUATION OF EASTERN GAMAGRASS (TRIPSACUM DACTYLOIDES)

Extensive acreage within the northeast is planted to corn silage. Frequently, the crop is harvested too late to allow for the establishment of adequate winter cover, resulting in widespread soil erosion. The identification and improvement of a perennial grass for use as a silage would be of great benefit in reducing the amount of soil lost to field runoff. Soil erosion would be further reduced through the introduction of a highly productive and palatable forage grass for use on marginal cropland.

Eastern gamagrass (*Tripsacum dactyloides*) is a tall, perennial, warm-season bunch grass. Native populations are typically monoecious with the pistillate spikelets located below the staminate on terminal racemes. Distribution is from Massachusetts west to Nebraska, south to Texas and Florida. Eastern gamagrass grows in drainage areas, streambanks, and moist places. The grass is highly productive and extremely palatable, often being greatly reduced in natural stands through preferential grazing. However, widespread use of Eastern gamagrass has been hindered by low seed production, inferior seed quality, lack of natural persistence, and difficulties with vegetative propagation.

In 1981, a mutant sex form (GSF-I) was collected from Ottawa County, Kansas. GSF-I exhibited gymonoecy with pistillate spikelets below and perfect spikelets above. As a result, the number of pistillate spikelets increased by approximately twenty five-fold leading to a large potential increase in the amount of seed production.

The Cape May PMC is currently evaluating 106 accessions of Eastern gamagrass, 59 accessions of which represent native material with normal seed production (monoecious sex form of MSF) and 47 accessions which represent sexually-deviant material (gymonoecious sex form or GSF) received from the USDA/ARS Woodward, Oklahoma Experiment Station. The MSF plants appear to be tetraploid because of their size and leaf width. Half of the MSF accessions were examined with a flow cytometer at Cornell University during the summer of 1992. The flow cytometer measures the weight of DNA and showed that all MSF plants examined were tetraploid. This information has lead us to the conclusion of not crossing the MSF and GSF accessions. Instead, two separated crossing increase blocks were established in 1993 on center, one for the top eight MSF accessions and one for the top eight GSF accessions. In 1994, two cultural studies will take place to examine stand establishment. One will deal with different seeding rates and the other will deal with stratified versus non-stratified seed.

INITIAL EVALUATION OF COMMON SAINFOIN
(ONOBRYCHIS VICIAFOLII)

Both wind and water erosion forces carry off an excessive amount of soil from conventionally tilled cropland which doesn't employ the use of winter cover crops. This also holds true for cropland which lays fallow. Numerous annual grains have been used to control these erosive forces during the non-growing season, such as cereal rye, winter wheat, and oats. The use of permanent cover crops is now being pursued under new conservation tillage concerns. Legumes, in general, offer potentially more than just winter cover, such as the grains listed above; they possess the ability to make more nitrogen available for the primary crop. More available nitrogen overall often results in greater yields. Common sainfoin, one such legume, is currently being evaluated for its permanent vegetative cover attributes. This plant has the potential to be utilized for many conservation activities including critical area stabilization, no-till cropping systems, animal forage, wildlife cover, and permanent cropland cover; as well as revitalizing over-cropped land by contributing more organic material and nitrogen fixation. All such uses of this Eur-Asian native will be considered after more is known of its growth characteristics and adaptability to the Mid-Atlantic region.

In June of 1990, one hundred and fifty-six accessions were seeded at the Cape May Plant Materials Center in twenty foot rows. Within the first growing season, 127 accessions emerged. The success of those accessions which did emerge varied greatly. It was noted during December of 1990 that this species showed good vigor for most accessions with a vibrant dark green color. In 1991, 120 accessions survived the first winter at the Cape May PMC. The three top accessions of 1990, based upon vigor, foliage abundance, cover, stem density, and survival were again the top three in 1991; they were 313063, 372829, and 401468. In 1991, nine of the top ten accessions were in the top 25 of 1990. Viable seed was collected during the spring and summer of 1991 and 1992. Evaluations continued throughout 1991 and 1992. At the end of the 1992 growing season, ten accessions were identified as superior and adapted to the climate of the Cape May PMC. These ten accessions will be utilized in a Random Recurrent Phenotypic Selection (RRPS) system in 1994.

**INITIAL EVALUATION OF SUBTERRANEAN CLOVER
(TRIFOLIUM SUBTERRANEUM)**

Subterranean clover or subclover is used extensively as a winter annual clover in Australia. Here in the United States, it is utilized in California and Oregon with a small usage in the south. Although subclover is an annual, it reseeds readily. Subclover can be considered a "living-dead" mulch, in which it begins to grow during the late summer, survives the winter, sets blossoms in May and sets seed then dies in June and July forming a dense weed impervious mat. Subclover does not obtain much height during its growing season. It appears to be a good cover crop for no-tilling.

In 1992, an assembly of subclover was obtained to be grown at both the Cape May and Big Flats PMCs. Seed was started in the greenhouse during the summer at Cape May and seedlings were transplanted into the field in early September. The 243 accessions were placed in rod rows. A lot of variation could be seen in the plants. The assembly will be observed for adaptability to the Mid-Atlantic area.

The assembly of 243 accessions planted in 1992 showed about a fifty percent survival rate in 1993. The accessions in this assembly were obtained from many foreign countries. Accessions from the following countries had poor survival in New Jersey: Spain, Morocco, Israel, and Tunisia. Many accessions from the countries of Australia, Portugal, Greece, and United States had good performance. Most of the surviving accessions produced seed during the early summer of 1993. A small amount of seed was collected from these 125 accessions. The accessions will continue to be evaluated for use as a cover crop.

1993 WIND DIVERSION PROJECTS

**EVALUATION OF EASTERN RED CEDAR (JUNIPERUS VIRGINIANA)
FOR SCREENS AND WINDBREAKS**

EVALUATION OF EASTERN RED CEDAR (JUNIPERUS VIRGINIANA) FOR SCREENS AND WINDBREAKS

High wind velocity is one of the most damaging natural agents to cropland located along the Mid-Atlantic coastal plain. The prevailing currents often cause the transport of soil particles, resulting in erosion and widespread crop damage. Properly established windbreaks have proven effective in helping to reduce surface wind velocity. As such, the objective of this project is to evaluate Eastern red cedar (Juniperus virginiana) ecotypes for windbreak potential and to select a rapidly growing strain that possesses semi-dense foliage and elliptical form.

Eastern red cedar is a native conifer of wide distribution and great genetic diversity. Its adaptability to a variety of soil and climatic conditions has made the tree especially attractive for screening, windbarrier and landscape purposes.

As a result of Eastern red cedar's inherent genetic diversity for growth form, crown density, seedling vigor, and growth rate, it is very important that the released variety be uniform and stable for these characteristics. In 1989, production was approached by both the development of improved seed stock and by vegetative propagation. If a successful propagation method can be developed, a superior form could be identified and clonally duplicated for use as a commercially available windbreak tree.

In 1988, selections were made for the best ecotypes remaining within the project. Twelve females and five males were chosen and transplanted into a polycross nursery in order to promote random cross-pollination. In November of 1989, seed was collected, mixed, and broadcast into woody beds for harvest during the 1991 season. In the fall of 1991 and 1992, the seeds were planted in raised beds and separated according to the parental accession number that the seed came from. Annually, 1/0 seedlings will be used for the establishment of progeny tests and field plantings for final evaluation.

In April of 1993, a progeny test was established for seedlings propagated from the Eastern red cedar crossing block at the Cape May PMC. The seedlings were identified by their corresponding known parent. Ten 1/0 seedlings were established in rows for each of the accessions being tested. The intent of this test is to determine whether certain parental sources in the crossing block produce superior seedlings possessing the ideal windbreak characteristics. This test also allows the seedlings uniformity within each accession to be observed. During the establishment year, all accessions accrued more than six inches of height, were true to form for windbreak trees, and three of the twelve accessions were very uniform.

Although literature review indicates that the vegetative propagation of Eastern red cedar is difficult, several research teams have demonstrated improved success rates by varying the type and timing of cutting as well as through the use of non-traditional growth promoter treatments. In January 1993, a fourth vegetative probation study took place at the PMC. Lateral shoot cuttings were obtained from male and female trees, trimmed to approximately six inches, and subjected to the following growth promotion treatments:

- Treatment 1: IBA (10,000 ppm) in 50% alcohol
- Treatment 2: Rootone (2000 ppm NAA, 1000 ppm IBA, 40,400 ppm Thiram)
- Treatment 3: Control (Untreated) in 50% alcohol

Cuttings were then placed into a bottom-heated propagation bench in the PMC greenhouse. In addition, the growth promoter treatments were subjected to two whole plot treatments of humidity and no humidity. The humidity treatment was produced by a humidifier and plastic tent.

At three week intervals, ten cuttings from each accession and treatment were removed and examined for callus production, root production, root length, vigor and insect and disease damage. This evaluation ended in the twelfth week.

Table 1 is a summary of the study's percent of cuttings with callus production and root production, and mean root length at each of the evaluation dates. We see the humidity treatment produced more rooting and callusing than the no humidity treatment. In most cases, the female outperformed the male for the above criteria. Outside the tent, the Rootone treatment performed the best for root and callus production. The Control treatment outside the tent had good callus production. The IBA treatment outside the tent produced the most rooting followed by the Control treatment and lastly the IBA treatment. The most callusing produced under the tent was for the Control treatment followed by the Rootone treatment and the IBA treatment.

In conclusion, the present study has demonstrated that better root production of Eastern red cedar cuttings is found with female cuttings, humidity and Rootone.

Table 1

Percent of cuttings with callus production and root production and mean root length (mm) with certain time increments for the 1993 low-cost methodology for the vegetative propagation of Juniperus virginiana^{1/}

<u>Treatment</u>	<u>Mean</u>		<u>Mean</u>		<u>Mean</u>	
	<u>Percent Callusing</u>		<u>Percent Rooting</u>		<u>Root Length</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
<u>No Humidity</u>						
IBA (10,000 ppm)						
<u>No. of Weeks</u>						
3	0	0	0	0	0	0
6	0	0	0	0	0	0
9	0	0	0	0	0	0
12	0	0	0	0	0	0
<u>Rootone</u>						
<u>No. of Weeks</u>						
3	0	0	0	0	0	0
6	30	20	0	0	0	0
9	70	50	40	30	15	6
12	40	30	0	30	0	53
<u>Control</u>						
<u>No. of Weeks</u>						
3	0	0	0	0	0	0
6	10	50	0	0	0	0
9	30	40	0	0	0	0
12	30	60	0	0	0	0
<u>Humidity</u>						
IBA (10,000 ppm)						
<u>No. of Weeks</u>						
3	20	0	0	0	0	0
6	10	0	10	0	1	0
9	10	20	10	10	6	63
12	10	30	10	30	21	51
<u>Rootone</u>						
<u>No. of Weeks</u>						
3	20	30	0	0	0	0
6	20	60	10	30	1	19
9	20	40	10	40	1	28
12	20	60	10	60	2	72
<u>Control</u>						
<u>No. of Weeks</u>						
3	30	100	0	0	0	0
6	20	90	0	10	0	55
9	20	90	0	60	0	72
12	0	70	0	50	0	30

^{1/} Study was planted on January 22, 1993. Evaluation began on February 17 and was completed on April 23, 1993. Two whole plot treatments (humidity and no humidity) of 80 cuttings total (forty male-9047099, forty female-9047095) were evaluated per split plot (growth hormone) treatment per whole plot treatment.

1993

CONTRACTILE AGREEMENTS WITH THE NATIONAL PARK SERVICE

1. ANNUAL PROGRESS REPORT FOR ASATEAGUE
ISLAND NATIONAL SEASHORE
2. ANNUAL PROGRESS REPORT FOR GATEWAY NATIONAL
RECREATION AREA

Cape May Plant Materials Center
USDA-Soil Conservation Service
Cape May Court House, NJ

January 13, 1994

1993 PROGRESS REPORT for ASSATEAGUE NATIONAL SEASHORE

Project Background

In 1991, the Cape May Plant Materials Center has entered into a contractile agreement with the National Park Service's Assateague Island National Seashore. This unique barrier island has an unspoiled dune ecosystem, which is rare for the Mid-Atlantic coastline. This unspoiled coastal environment on Assateague Island attracts only a small portion of its annual visitors; the population of wild ponies is the main show pleaser. The chance to see a pony in the wild draws people from across the U.S.; these same ponies also create interesting management challenges to the National Park Service (NPS). The agreement between Assateague and Cape May secures the propagation and production of plants and seed from species native to this national seashore (NS). The plant products from Cape May will be primarily targeted at the revegetation effort to mend road scars of newly constructed or repaired public use areas. In addition, some of the materials will be used to protect existing roads and access. In total there will be three grass, three forb, five shrub, and three tree species provided to Assateague Island NS, by 1995.

All efforts by the Cape May PMC during the first two years focused on seed collections, refinement of seed processing techniques, and establishment of seed production plots. Every effort was made to collect germ plasm from this NS when feasible, as requested by the NPS. Since 1992 most of the activities of the Cape May PMC have focused on the production of seedling stock and seed from the fourteen species requested. Much effort has been invested to determine the most effective and efficient means to propagate these native species; most of which have never been grown by commercial or research nurseries. The data enclosed in the remainder of this report show in detail the first year's (1993) production estimates. The seed collection has been completed, but as supplies are depleted or new plants are requested supplemental collections will be necessary.

The plant materials provided through these contracts will be established at twelve different publicly accessible sites throughout Assateague Island NS. The first delivery of plants from Cape May was made in March of 1993; this shipment was for 100,000 American beachgrass culms. These vegetative divisions were established at various locations in an attempt to protect newly improved road accesses from hard pounding fall and winter storm waves. Seed, potted forbs, and bare-rooted seedlings are scheduled for delivery early in 1994.

Cape May Plant Materials Center
USDA-Soil Conservation Service
Cape May Court House, NJ

January 13, 1994

1993 PROGRESS REPORT for GATEWAY NATIONAL RECREATION AREA

Project Background

Since 1990, the Cape May Plant Materials Center has entered into three contractile agreements with the National Park Service's Gateway National Recreation Area. A unique parcel of federal land, intertwined with the shadows of New York City, this park system is visited by more people annually than most of the others parks throughout the U.S. These agreements secure the propagation and production of plants and seed from species native to this national recreation area (NRA). The plant products from Cape May will be established on this NRA's Breezy Point, Jamaica Bay, and Sandy Hook management units. The primary targets of this revegetation effort are road scars, new road beds, and improved resource access for public use. In total there will be five grass, four forb, five shrub, and seven tree species provided to these three management units of Gateway NRA.

All efforts by the Cape May PMC during the first two years focused on seed collections, refinement of seed processing techniques, and establishment of seed production plots. Every effort was made to collect germ plasm from this NRA when feasible, as requested by the National Park Service (NPS). Unfortunately due to past destructive property management practices at these locations, prior to NPS occupation, many of these species are only known to be historically native and indigenous. The species which are absent or rare on the Gateway NRA properties can be easily identified in the summaries to follow by the non-Gateway collection locations. Most seed collection has been completed, but as supplies are depleted or new plants are requested supplemental collections will be necessary.

The plant materials provided through these contracts will be established at seven primary road and access sites in the three NRA management units. In 1993, 3000 bare-root seedlings were provided to the Jamaica Bay and Breezy Point units. A new parking facility was developed at the Jamaica Bay Wildlife Refuge; it needed additional native plant species for the revegetation of the work site. At the Fort Tilden area of Breezy Point a beach access was improved, which included the expansion and improvement of a parking lot. This site work also required native plants to revegetate the disturbed areas. There are four remaining construction sites on the Sandy Hook unit which will need revegetation beginning in 1994 and some additional vegetative improvement is needed at the Floyd Bennett Field area in the Jamaica Bay unit.

1993 MISCELLANEOUS PMC PROJECTS

1. INITIAL EVALUATION OF CULTURAL TECHNIQUES
AND PLANT BREEDING ON SEED YIELD
OF PANICUM VIRGATUM
2. EVALUATION OF BUFFALOGRASS (BUCHLOE DACTYLOIDES)
AS A LOW INPUT ALTERNATIVE FOR TURF
3. INITIAL EVALUATION OF VETIVER GRASS
(VETIVERIA ZIZANIOIDES)

**INITIAL EVALUATION OF CULTURAL TECHNIQUES AND PLANT BREEDING ON
SEED YIELD OF PANICUM VIRGATUM**

Switchgrass (Panicum virgatum) is a warm-season grass native to the Great Plains and most of eastern United States. The major uses of switchgrass are for pasture and hay but the grass can also serve to stabilize critical areas. In addition, switchgrass is beneficial to wildlife serving as food and cover.

A promising accession of switchgrass for critical area stabilization was recognized by the Cape May PMC. This accession, 421138, or commonly referred to as NJ-50 by the PMC staff, is robust with excellent forage production. Unfortunately, NJ-50 has low seed production.

In 1991, two studies were initiated in an attempt to increase the seed production of NJ-50. One study was cultural in nature and the other involved plant breeding.

The cultural study of 1991 compared seed yields from switchgrass in rows and switchgrass in solid stands. One and a half acres of previously solid stand switchgrass was cultivated into 40 inch spaced rows. Another acre and a half of solid stand switchgrass was used as a comparison. The seed yield results showed the solid stand plot produced 287 lbs/A (197 lbs PLS/A). The row plot produced 179 lbs/A (105 lbs PLS/A). Seed yields for both plots were lower than desired. Surprisingly, the solid stand had a higher yield, although it was just one year's worth of data.

The cultural study of 1992 again compared seed yields of the row and solid stand plots. In addition, these plots were divided in half and one half was burned in the late winter and the other half was not. The following seed yields were obtained: no burn solid stand 136 lbs/A (72 lbs PLS/A); no burn rows 158 lbs/A (98 lbs PLS/A); burned solid stand 94 lbs/A (33 lbs PLS/A); burned rows 196 lbs/A (117 lbs PLS/A). The burned rows had the highest yield followed by the no burn rows, no burn solid stand and burned solid stand. The yields for the solid stand were expected to be the reverse of those found. This was again one year's worth of data on the effect of burning and additional data is needed.

The cultural study of 1993 was a duplicate of 1992. Unfortunately a drought occurred during the summer and the seed yields were extremely poor. The following seed yields were obtained: no burn solid stand less than 1 lb/A; no burn rows less than 1 lb/A; burned solid stand 5 lbs/A; burned rows 32 lbs/A. This study will be run again in 1994.

The plant breeding study began in 1991. It was decided to use NJ-50 as germplasm in crosses to other switchgrasses which have good seed production. Six synthetic populations were obtained from Dr. Timothy's breeding program at North Carolina State University. One hundred plants of each population were planted at the center. In addition, plants of 'Cave-in-Rock', 'Blackwell', and 'Kanlow' were also planted. The plants were observed and replaced as needed during 1992 and 1993. In 1993, seed of promising plants were collected from each population and each cultivar. These plants were allowed to open-pollinate with a three acre field of NJ-50 which is 150 feet away and were open-pollinated with each other. A progeny test will be made in 1994.

**EVALUATION OF BUFFALOGRASS (BUCHLOE DACTYLOIDES)
AS A LOW INPUT ALTERNATIVE FOR TURF**

Most cool season turf grasses used in today's turf industry require large volumes of irrigation to maintain that lush green color so often demanded by homeowners and turf managers. In some cases, due to municipal or state water restrictions, these water hungry lawns can not be watered as needed. This results in the grass browning off in mid-summer leaving the landowner displeased with the condition of their lawns. One alternative to this dilemma that the Soil Conservation Service (SCS) plant materials program has pursued is the use of warm season turf grasses. Buffalograss (Buchloe dactyloides) is one species which has received much attention from ARS as well as the plant materials program which seems promising.

Buffalograss is a low growing (4-6 inches) warm season grass, native to the short grass prairies of the Great Plains of the central portion of the United States. Much of its native range doesn't receive more than 15 inches of annual precipitation. Another beneficial adaptation of this grass is its low requirement for added nitrogen; the nutrient so often linked to groundwater contamination. The species is a mat forming perennial which is deciduous, producing a starlike cluster of two to five seeds. Although this species produces seed, its primary means of spread is by stolons. The network of root and stolons existing in a stand of buffalograss serves as an exceptional soil binder protecting against erosion. The primary growth point of this grass species is at the soil surface. This characteristic offers the turf manager or landowner the option of mowing the stand of grass to very low heights (.5 inches) without damaging the individual plants.

In 1992, two cultivars of buffalograss 'Top Gun' and 'Plains' were established at the Cape May PMC with two cool season grasses used in the region: 'KY-31' tall fescue (Festuca arundinacea) and 'Pennfine' (Lolium perenne) perennial ryegrass. All four cultivars were established on firm well prepared 20' x 50' plots in June and received the exact same management. During the establishment period (2 months), all plots received one inch of irrigation including precipitation, every two weeks in a minimum of four increments. After two months, the irrigation rate was reduced to one inch per month until October. All plots established well under this management regime. Once established, weed invasion was easily controlled with biweekly mowing.

All four plots were divided into thirds in April of 1993, prior to green-up, forming three sub-plots for each cultivar. Three nitrogen fertilizer rates (0, 15 lbs/A, 30 lbs/A of N) were applied evenly by hand to each of the sub-plots in June to observe vegetative response (10-10-10 was used). No irrigation was applied to the plots throughout the very dry summer of 1993 and vehicle traffic was applied weekly to observe the tolerance

of each cultivar. During this summer, the grass stands in each plot were only mowed monthly. The results of this first year were promising. Each buffalograss plot had good stolon production developing solid stands. There seemed to be little or no response to fertilizer applications or traffic. The cool season grasses did respond ever so slightly to the fertilizer applications but this alone could not help them in August. The estimated average percent cover in the cool season plots was 55% for July and August as compared to 90-100% coverage by the buffalograss. In 1994, the Cape May PMC staff will be repeating this management schedule to confirm the superior low input performance of buffalograss over popular cool season grasses.

**INITIAL EVALUATION OF VETIVER GRASS (VETIVERIA ZIZANIOIDES)
FOR ADAPTABILITY TO THE MID-ATLANTIC SERVICE AREA**

Vetiver grass (Vetiveria zizanioides) is an Asian species that is primarily used for vegetative contour hedges and by the perfume industry. It is a densely tufted bunchgrass with stout culms up to two meters (6 feet) in height and terminal flowers consisting of numerous narrow racemes oriented in whorls along a central axis. Vetiver grass has an extensive branching root system that is considered useful for the prevention of soil erosion. Vetiver had been reported to lack viable flowers, rhizomes, or stolons, instead being propagated solely by root division or vegetative slips. However, two ecotypes of the grass have recently been documented: (1) a northern flowering type and (2) a southern non-flowering type. The two ecotypes differ in tolerance. Vetiver is native to warmer climates, being best suited to temperatures ranging from 21.0 to 43.5°C. Prior to introduction to the Mid-Atlantic region, the northern-most successful planting has been in Rome, Italy, roughly 42°N in latitude and Mediterranean in climate.

The Cape May PMC currently is examining four accessions of vetiver grass:

- 196257 - Imported by the USDA/ARS Southern Regional Plant Introduction Station in 1951. No other available information.
- 213903 - Imported by the USDA/ARS Southern Regional Plant Introduction Station. Originally collected near Allahabad, India.
- 271633 - Collection number 1027 by the USDA/ARS, as imported through the Southern Regional Plant Introduction Station. Original collection site was located 18 km north of Karmola, India.
- 302300 - Collection number A-7016 from India, as presented to the USDA/ARS Southern Regional Plant Introduction Station by Oklahoma State University.

All accessions were sent to the Cape May PMC as two-year-old stock from the National PMC in Beltsville, Maryland. On May 3, 1990, 18 plants from each accession were outplanted at the Cape May PMC.

The vetiver accessions were excepted to winter kill as Cape May, New Jersey is considered too far north for the growth of the grass. By the spring of 1993, it was found that 50-88% of each accession number was showing regrowth. Its believed the mild winters were the cause of this survival percentage. Although survival was high, the regrowth of the plants was fair to poor. Growth was found on the leeward side of the plants and was more sparse than expected.

CAPE MAY PMC CROP FIELDS

<u>Field No.</u>	<u>1993</u>
1	Inter-Center Strain Trial Test; <u>Uniola paniculata</u> ; Sea Oats Nursery, <u>Ammophila breviligulata</u> , American Beachgrass Nursery, <u>Panicum virgatum</u> Switchgrass Nursery, <u>Cynodon dactylon</u> , 'Tufcote' Bermuda Grass
2	<u>Onobrychis viciafolii</u> , sainfoin; <u>Anthoxanthum odoratum</u> , sweet vernalgrass
3&4	<u>Panicum virgatum</u> , NJ-50 switchgrass
5&6	<u>Juniperus conferta</u> , 'Emerald Sea' shore juniper; <u>Myrica pensylvanica</u> , bayberry; <u>Prunus maritima</u> , beachplum; <u>Lathyrus sylvestris</u> , 'Lathco' flatpea
7	<u>Elaeagnus umbellata</u> ; autumn olive; Various Woody Production Species in Raised Beds
8	Vacant-Summer; Winter-Cover Crop
9	Initial Increase Field
10	<u>Ammophila breviligulata</u> , 1994, 'Cape' American Beachgrass Production
11	Cold Tolerant Cover Crop Study; <u>Ammophila breviligulata</u> , American Beachgrass Longevity Study; Shrub Windbreak Demonstration Study; <u>Buchloe dactyloides</u> Adaptability Study; <u>Trifolium subterraneum</u> Evaluation; Progeny Test of <u>Juniperus virginiana</u>
12	<u>Panicum amarum</u> (P. <u>amarulum</u>) 'Atlantic' Coastal Panicgrass Production
13	<u>Lespedeza thunbergii</u> , 'VA-70' Shrub Lespedeza Production
14	Vacant-Summer; Winter-Cover Crop
15	<u>Spartina alterniflora</u> , Smooth Cordgrass Increase; <u>Ammophila breviligulata</u> , 'Bogue' American Beachgrass Increase
16	Natural - Wildlife Area
17	Permanent Grass Cover
18	<u>Robinia pseudoacacia</u> , Black Locust Holding Block

CAPE MAY PMC CROP FIELDS

<u>Field No.</u>	<u>1993</u>
19	<u>Rosa rugosa</u> , Poly Cross; <u>Ammophila breviligulata</u> , 'Hatteras' American Beachgrass Increase; <u>Spartina patens</u> , Saltmeadow Cordgrass
20	Permanent Grass Cover
21	Vacant-Cereal Rye; Winter-Cover Crop; Crossing Blocks of <u>Solidago sempervirens</u> and <u>Tripsacum dactyloides</u>
22	Woody Tree and Shrub Holding Block
23	<u>Panicum amarum</u> (P. <u>amarulum</u>) 'Atlantic' Coastal Panicgrass Production
24&25	Vacant-Summer; Winter-Cover Crop
26	<u>Ammophila breviligulata</u> , 1993, 'Cape' American Beachgrass Production for Contracts
27	Vacant-Summer; Winter-Cover Crop; Filter Strip Water Quality Study; Woody Progeny Test
28&29	Vacant-Summer; Winter-Cover Crop
30	<u>Lathyrus sylvestris</u> , 'Lathco' Flatpea Holding Block; <u>Tripsacum dactyloides</u> ; IE of <u>Uniola paniculata</u> ; Superior Vigor Crossing Block
31	Vacant-Summer; Winter-Cover Crop
32	<u>Juniperus virginiana</u> , eastern red cedar; <u>Carex kobomugi</u> , 'Sea Isle' Japanese Sedge Production
33	Vacant-Summer; Winter-Cover Crop
34	Vacant-Summer; Winter-Cover Crop
35&36	Seed Nursery for National Park Service Contracts and Raised Bed Woody Production
37&38	Vacant-Summer; Winter-Cover Crop
39	Vacant-Summer; Winter-Cover Crop
40	<u>Myrica cerifera</u> ; Wax Myrtle Holding Block; <u>Lonicera maackii</u> ; 'Rem-Red' Amur Honeysuckle Seed Orchard

PAST & FUTURE RELEASES of the CAPE MAY PMC
1993

SCIENTIFIC NAME	COMMON NAME	CULTIVAR NAME	PRIMARY USE	YEAR of RELEASE
<i>Ammophila breviligulata</i>	Am. beachgrass	Cape	Frontal Dune	1972
<i>Anthoxanthum odoratum</i>	sweet vernalgrass	--	Buffer Strips	1998
<i>Carex kobomugii</i>	Japanese sedge	Sea Isle	Mid Dune	1983
<i>Juniperus conferta</i>	shore juniper	Emerald Sea	Mid Dune	1986
<i>Juniperus virginiana</i>	eastern red cedar	--	Wind-break	1998
<i>Lespedeza thunbergii</i>	shrub lespedeza	VA-70	Wildlife/ Critical Area	1979
<i>Lonicera maackii</i>	amur honeysuckle	Rem-Red	Wildlife/ Critical Area	1970
<i>Myrica pensylvanica</i>	bayberry	--	Back Dune	1993
<i>Onobrychis viciaefolia</i>	sainfoin	--	Cover Crop	1998
<i>Panicum amarulum</i>	coastal panicgrass	Atlantic	Mid Dune	1981
<i>Panicum amarum</i>	bitter panicgrass	--	Frontal Dune	1997
<i>Panicum virgatum</i>	switchgrass	NJ-50	Wildlife/ Critical Area	--
<i>Prunus maritima</i>	beach plum	--	Back Dune	1993
<i>Rosa rugosa</i>	rugosa rose	--	Back Dune	1993
<i>Solidago sempervirens</i>	seaside goldenrod	--	Mid Dune	--
<i>Spartina alterniflora</i>	smooth cordgrass	Bayshore	Tidal Marsh	1992
<i>Spartina patens</i>	saltmeadow cordgrass	Avalon	Tidal Marsh	1986
<i>Spartina patens</i>	saltmeadow cordgrass		Mid Dune	1996

SCIENTIFIC NAME	COMMON NAME	CULTIVAR NAME	PRIMARY USE	YEAR of RELEASE
<i>Tripsacum dactyloides</i>	eastern gamagrass	--	High Erodible Cropland	1997
<i>Uniola paniculata</i>	sea oats	--	Frontal Dune	1996

PLANT DESCRIPTIONS
of Commercially Released Cultivars
from the Cape May PMC

'Rom-Red' Amur Honeysuckle (*Lonicera maackii*)

'Rom-Red' is a multi-stemmed, vase-shaped shrub that grows to a height of 8 to 12 feet. The plant is well suited for ornamental use or as a screen on large lots. Its primary use is to supply a source of food for wildlife during the critical winter period.

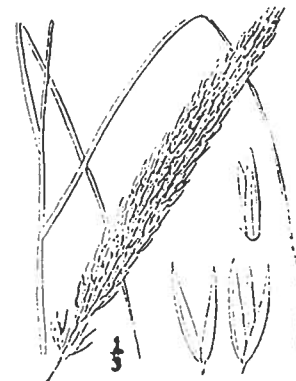
The plant's bright red fruit is about one-fourth inch in diameter and matures in late September and October. Amur honeysuckle grows best on deep, well-drained soil. The plant grows well in slightly acid soils with a sandy, loamy, or moderately clayey texture.

Rom-Red was released in 1970 as a multi-purpose plant. An adequate seed supply exists for commercial production.



'Cape' American beachgrass (*Ammophila breviflorata*)

'Cape' was released for commercial production in 1972. It is a superior strain of American beachgrass. It is used along the mid-Atlantic coast for initial stabilization and establishment of sand dunes. Cape is robust, easy to plant, and spreads rapidly by vigorous rhizomes. It has healthier leaves and thicker culms or stems than common American beachgrass. An adequate supply of Cape beachgrass plants are available for commercial production.



'VA-70' Shrub Lespedeza (*Lespedeza thunbergii*)

'VA-70' shrub lespedeza is a herbaceous legume with a semi-woody stem. It is an upright perennial with stems growing 4 to 6 feet tall. The leaves are more linear than oval and are approximately 2 inches long and one-half inch wide. Attractive pink to purple flowers appear in late summer. It is an excellent source of winter food and habitat for wildlife. Pheasants and bobwhite quail use its seed for food in fall and winter. Rabbit and deer browse the leaves and bees produce honey from the flowers.

You can use VA-70 shrub lespedeza almost anywhere that shrubs are appropriate. When used in hedges and borders, VA-70 is an attractive landscape feature. The plant is particularly well suited to seeding steep banks along channels and ditches or for wildlife borders along those water courses. It is useful as a border between cropland and woodland, as contour hedges between crop strips, along diversion terrace boundaries, and in small odd areas set aside for wildlife.

VA-70 shrub lespedeza can be used alone or with other plants. An adequate supply of seed is available for commercial production.



'Avalon' Saltmeadow Cordgrass (*Spartina patens*)

'Avalon' is a strongly rhizomatous, salt tolerant perennial grass that grows up to 2-1/2 feet tall. Its rhizomes are long and slender and produce most of the new growth.

Avalon is unique in that it spreads quickly and produces a more dense root system and finer roots than most other saltmeadow cordgrass strains.

The principal conservation use of Avalon is to vegetate and restabilize brackish and fresh water tidal streambanks. It is salt tolerant and can be established immediately above the mean high tide elevation. It is well adapted to a range of soils, will tolerate occasional inundation by storm tides, and has the ability to trap and grow through thin layers of sand. Avalon is also adapted to low elevation coastal sand dunes and can be used to supplement other sand dune vegetation.

For establishment, both potted and bare-root plants can be used. An adequate supply of bare-root plants is available for commercial production.



'Atlantic' Coastal Panicgrass (*Panicum spargum* var. *maritimum*)

'Atlantic' is a tall, robust, native warm season perennial grass. Its growth habit is upright, with stems reaching a height of 4 to 6 feet. The plants have the appearance of a bunch grass, although they produce short rhizomes. 'Atlantic' has strong seedling vigor and reliable seed production under cultivation. It performs satisfactorily on sandy, droughty infertile soils and on heavy imperfectly drained soils.

The principal use of 'Atlantic' is for stabilizing disturbed sandy sites. It can be direct seeded on sand dunes except for active frontal dunes. It has also been successfully established on surface mined areas, sanitary land fills, dredged spoil fills, sand and gravel mines, road side embankments and similar disturbed areas. While most stands of 'Atlantic' are established by drilling the seed, small areas can be vegetated with seedling plants.

Field tests show 'Atlantic' to be well adapted in the coastal plain and piedmont region from Massachusetts to Texas. It has also been grown inland in Pennsylvania and Ohio. 'Atlantic's resistance to lodging and its seed production also enhance its value as food and cover for wildlife.

It was cooperatively released by the Soil Conservation Service and the New Jersey Agricultural Experiment Station in 1981. Limited quantities of seed are available for commercial production.



'Sea Isle' Japanese Sedge (*Carex kobomugi*)

Japanese sedge has been introduced onto the dunes from New Jersey south to Virginia. It is native to northeastern Asia and exhibits several desirable characteristics for stabilizing sand dunes. Japanese sedge, a salt tolerant tufted plant, differs from most related sedges by growing in drier areas. The plant, which grows 8 to 10 inches tall, spreads primarily by short rhizomes which root at the nodes. Because of the short internodes, a mature stand of Japanese sedge is usually dense, with almost complete ground cover. This cool season plant remains green well into fall and can tolerate some, but not continuous, foot traffic.

'Sea Isle' tends to be long-lived on stable sand dunes. In addition, Japanese sedge appears to be tolerant of pests and low soil fertility. Consequently, 'Sea Isle' may exist with less management. However, it will flourish under high levels of management such as routine fertilization and protection from pedestrian or vehicle traffic.

During the year of establishment, Japanese sedge has a higher mortality rate and exhibits little lateral spread when planted in spring. However, those established in the fall of the year prove to have good survival. Regardless, after the first year, stands of 'Sea Isle' continually improve in both vigor and density.

The plant was released in 1983 by the Soil Conservation Service and the New Jersey Agricultural Experiment Station. Limited quantities of plants are available for commercial production.



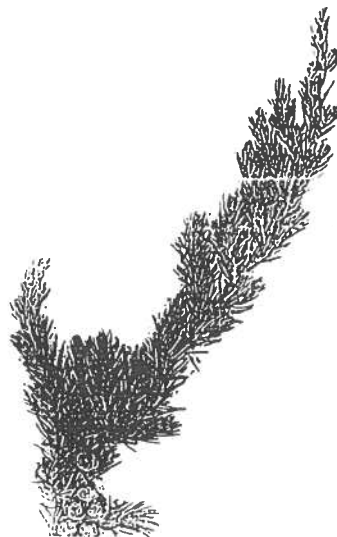
'Emerald Sea' Shore Juniper (*Juniperus conferta*)

'Emerald Sea' is a low-growing or trailing evergreen shrub which grows to approximately one foot in height. Its needles are greenish blue, softer than most junipers, and one-half to one inch long. The needles retain their blue-green color very well during the winter. Mass plantings produce a dense and uniform ground cover.

Shore juniper is well suited for planting on sand dunes near the seashore where other junipers do not grow successfully. It has good salt tolerance and grows well in sandy soils.

'Emerald Sea' is often used for mass or border plantings around buildings and as foreground for taller plant groups. It is also a versatile ground cover plant for steep banks around buildings, parks, and playgrounds.

An adequate supply of unrooted cuttings are available for commercial production.



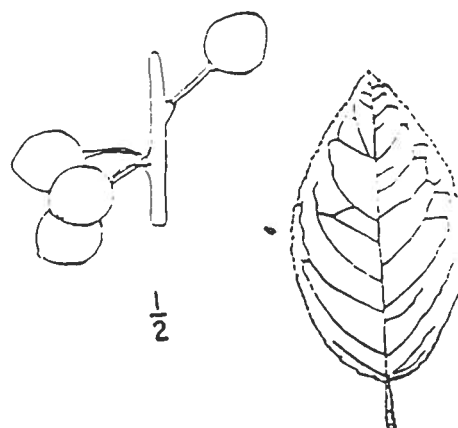
'Bayshore' smooth cordgrass
Spartina alterniflora

Smooth cordgrass, a long life perennial, is the dominant, most productive, marsh plant in the intertidal zone along the Atlantic and Gulf coast from Newfoundland to Florida and Texas. 'Bayshore' smooth cordgrass grows three to five feet tall with stems up to 1/2 inch in diameter. 'Bayshore' was selected over other accessions due to its higher stem density, which will aid in its ability to protect eroding shorelines. The leaves are twelve to twenty inches long, tapering to a point. The seedheads, produced in September and October, are ten to twelve inches long and hold twelve to fifteen spikelets, each two to three inches long. Its primary method of spread is by vigorous, hollow rhizomes; seed viability is medium to low.



'Ocean View' beach plum
Prunus maritima

Beach plum is a medium to large sized shrub native to the Atlantic coastal region. This straggling deciduous shrub of the back sand dunes may reach four to seven feet, while when grown inland it may grow to heights of sixteen to eighteen feet. The finely serrate leaves are dull green with elliptical to egg shape. Prior to leaf out in early spring, the entire shrub is covered with a bloom of snowy white flowers. Each individual flower measures 1/4 to 1/2 inches in diameter and occur in axillary clusters. By late-summer the flowers develop into 1/2 to 3/4 inch round, purplish-black, edible, fleshy fruit. In addition to reproducing from seed, beach plum is capable of spreading by means of layering on the dunes. Ocean View grows best on medium fertility, slightly acidic, loamy or sandy soils with excellent drought tolerance.



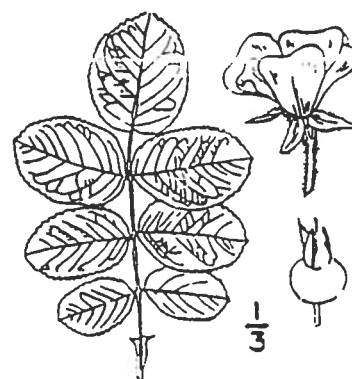
'Wildwood' bayberry
Myrica pensylvanica

After almost fifteen years of evaluation, 'Wildwood' bayberry has been released to the commercial nurseries for sand dune stabilization. Although Wildwood will seldom grow taller than five feet on the sand dunes, it is not uncommon for this shrub to attain heights of nearly ten feet on inland sites. This upright shrub has dark green aromatic leaves which are serrated, and average 1 1/2 inches in length. Dioecious flowers form inconspicuously, developing into waxy grayish-white fruit on female plants. The fruit ripens in October, and are eaten readily by both songbirds and gamebirds as a winter staple. Although released as a back dune stabilization plant, Wildwood should not be over looked for coastal landscapes, or for use in wildlife food and cover plots along the Atlantic coastal plain.



'Sandy' rugosa rose
Rosa rugosa

In December of 1992 'Sandy' rugosa rose was officially released to the commercial nursery market, primarily as a back dune stabilization plant for the Mid-Atlantic coastal plain. This showy but hardy shrub is one of the few species of rose which can withstand salt spray. This deciduous plant has dark green compound leaves. The stems are covered with needle-like thorns. These shrubs can attain heights of four to five feet. A very popular characteristic of Sandy is its large (2-3 inches) diameter flower blooms, which range in color from white to purple. In late summer the flowers give rise to equally colorful orange to red hips. This rose grows best on coarse to medium textured soils of the Mid-Atlantic coastal plain. Unlike many common wild roses, Sandy spreads primarily by slow growing rhizomes.



1993 PRESENTATIONS, PUBLICATIONS AND WORKSHOPS

PRESENTATIONS:

"Lysimeter Studies of Big Flats and Cape May PMC's";
S. Primard, Atlanta, GA, 3/18/93

Cultural Presentation on Nigeria to PMC staff; by S.
Primard, 9/93.

"Dedication of Bayshore" smooth cordgrass; by D. Hamer,
Cambridge, MD, 5/26/93.

Women's History in Agriculture presentation to PMC staff;
by S. Primard, 9/93

TOURS OF THE CAPE MAY PMC:

SWCS members from England

University of Delaware School of Marine Sciences
staff members

PUBLICATIONS:

"Restoration of Sand Dunes Along the Mid-Atlantic Coast",
D. Hamer, C. Miller, and C. Belcher

WORKSHOPS:

"Sand Dune Restoration"; by D. Hamer, C. Miller, and
Dr. Psute for:
Monmouth SCD
Cape/Altantic SCD

1993 TRAINING RECEIVED

January	4	Sludge Management Workshop, New Brunswick, New Jersey (Primard)
	27	SCS NJ Technical Writing Skills Workshop, Somerset, New Jersey (Primard)
	13	NJ Native Plants Symposium, Columbus, New Jersey (Hamer, Fournier, Primard)
February	3	Landscape Restoration, New Brunswick, New Jersey (Hamer, Fournier, Primard)
		Regional Grounds Maintenance Conference held in Ocean City, New Jersey (Fournier, Futrell)
March	14	TQM, Road Mapping to Success Training, Hammonton, New Jersey (Entire Staff).
May	2-8	386 Computer Training, NENTC, Chester, Pennsylvania (Turnier).
June	14	Biology of Trees and Shrubs, State College, Pennsylvania (Fournier, Primard).
September	23	Management Problems of the Technical Person in a Leadership Role, Cherry Hill, New Jersey (Fournier, Primard)
November	15	Soil Bio-Engineering Short Course, New Brunswick, New Jersey (Fournier, Primard)

EQUIPMENT PURCHASED

Chevy 1500 Pick Up

Seed and Plant Storage Room Refrigeration Compressors

Environmentally Safe Irrigation Fuel Tank

GMC 3500 Dump Truck

Buildings Re-roofed

044 Stihl Chainsaw

1993 CAPE MAY PMC PLANT & SEED DISTRIBUTION

<u>Cultivar</u>	<u>Species</u>	<u>Amount</u>		<u>States of Distribution</u>
		<u>No.</u>	<u>Lbs.</u>	
Atlantic	coastal panicgrass		102	NY, NJ, WV, LA, RI, MS, DE, MD
Avalon	saltmeadow cordgrass	52,460		MA, MD, MO, WV DE, NJ, NY, VA
Bayshore	smooth cordgrass	1,705		MD, MO, NY
Cape	American beachgrass	179,220		DE, MA, MD, CT NC, NJ, NY, WV SC
Emerald Sea	shore juniper	950		MD, MA, PA
NJ-50	switchgrass		28	MD, DE, Argentina
Rem-Red	amur honeysuckle	197	6	MO, WI, ID, MI PA, LA
Sea Isle	Japanese sedge	1,400		MA, MD, LA
VA-70	shrub lespedeza		98	MD, RI, NJ, PA, WV
Wildwood	bayberry	1,020	2.5	MA, NJ, MO, MD CA, PA
Ocean View	beach plum	428	5.5	MA, MO, IA, NJ MD, CA, PA
Sandy	rugosa rose	464	4	MA, MO, IA, NJ MD, CA, PA, SC, NY, NC, France
TOTAL:		237,844	246	

